

## FABRICATION OF HOLLOW DOOR USING MODULAR PANEL

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### RIB COMPONENTS MADE FROM SCRAP WOOD

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#### Field of the Invention

[0001] The present invention relates wooden hollow doors fabricated with parts of scrap wood and wood composites.

[0002] In particular, the present invention relates to a hollow door using modular panel rib components and the method of fabricating the hollow door.

#### Background of the Invention

[0003] At present, hollow doors are constructed primarily of wood or wood composites. Such doors have a frame defining the shape and size of the door with panels or "skins" that form the two flat vertical sides of the door.

[0004] The hollow core of the door has ribs or spacers between the skins to give the door structural strength while keeping the overall weight of the door low.

[0005] The spacers are usually made of a flexible honeycomb of paper or cardboard, glued to the skins of the door.

[0006] While materials used may differ, similar methods of fabrication have also applied to partition panels, signboards, cabinets, writing (white or black) boards, table-tops, floors and ceiling panels, all of which utilize the same construction: that of panels separated by spacers.

[0007] One problem with using virgin wood strips as is the cost and weight. in addition, wood is getting scarce. One way to reduce reliance on virgin wood material is to substitute it with paper or cardboard as a spacer material. However, paper and cardboard is susceptible to moisture and dampness.

[0008] Another problem is that significant portion of the cost of the items is due to the manufacturing cost of the paper or cardboard honeycombs as specialized equipment are needed.

[0009] These problems in the current art are especially ironic since carpentry factories and workshops fabricating hollow doors and other furnishings generate a lot of off-cuts or scrap wood. Left unused, this scrap wood is usually disposed of as waste.

### **Summary of the Invention**

[0010] The present invention seeks to provide a method to render scrap wood or wood composites into modular components for the manufacture of wood hollow doors.

[0011] In particular, the present invention teaches methods for the rendering scrap wood or wood composites into modular components of panel ribs, elements of the present invention, for the manufacture of hollow wooden doors.

[0012] In another aspect, the present invention is a hollow door fabricated according to the methods of the present invention.

### **Brief Description of the Drawings**

[0013] A preferred embodiment of the present invention will now be more fully described, by way of example, with reference to the drawings of which:

[0014] FIG. 1 illustrates two hollow doors with the panel or "skin" from one side is partially removed to expose the hollow core of the door occupied by a honeycomb of paper one (FIG. 1A) and a modular latticework made from scrap wood in the other (FIG. 1B);

[0015] FIG. 2 shows the method of making panel ribs from short pieces of scrap wood using notches and connector blocks;

[0016] FIG. 3 shows the method of fastening panel ribs to a connector block in a radial pattern using conventional woodworking fasteners;

[0017] FIG. 4 shows how panel ribs may be joined with a notched connector; and

[0018] FIG. 5 shows two possible lattice arrangements in hollow doors under the present invention.

#### **Detailed Description of the Drawings**

[0019] In accordance with the present invention, methods of rendering scrap construction or manufacturing materials, particularly off-cuts from wood and wood composites into modular components, and a preferred embodiment of the invention, fabrication of a hollow door, are described.

[0020] In the following description, details are provided to describe the preferred embodiment. It shall be apparent to one skilled in the art, however, that the invention may be practiced without such details. Some of these details may not be described at length so as not to obscure the invention.

[0021] Here, all reference to wood material also refers to wood composites. Similarly, references to paper also refer to cardboard. As in the industry, the panels of the hollow doors are also referred to as "skins" in the present application.

[0022] The terms "connector" and "connector block" are also used interchangeably in the present invention. Both are used to join modular components to form panel ribs.

[0023] One aspect of the present invention is a method of rendering scrap wood into modular components for the assembly of panel ribs. This is done by making use of various ways to connect the modular components into a latticework of panel ribs to replace the paper or cardboard honeycomb between panels of the finished product.

[0024] While hollow doors may be made of materials other than wood, the present invention is directed to the panel ribs of hollow doors and similar

products made of wood and wood composite. However, hollow doors fabricated of materials other than wood or wood composite but utilizing the method taught in the present invention are within the scope and spirit of the present invention.

[0025] There are many advantages of the present invention. One advantage is that scrap wood may be used as panel ribs. Scrap wood or waste wood is also called "off-cuts". These are the remnants of wood left over from furniture manufacturing. They come in odd sizes and are usually of lengths too short to be useful for other purposes and are usually disposed of as waste.

[0026] This invention teaches methods of rendering these short pieces of scrap wood into useful components for panel ribs, the invention also teaches methods to join these components into useful configurations for use in hollow doors and similar furnishings.

[0027] By advantageously utilizing this hitherto useless material, the need to dispose of this scrap wood by either burning or dumping is greatly reduced, allowing the present invention to contribute in reducing impact on the environment.

[0028] Another advantage of the present invention is that wood, especially wood composite, is more moisture resistant than paper or cardboard. When used as panel ribs, the final product is more durable in damp or humid environments.

[0029] Hollow doors made with wood panel ribs are structurally stronger than those made with paper or cardboard honeycomb.

[0030] While heart of the invention is the idea of joining modular pieces of wood into panel ribs, the various methods of joining the strips of wood are encompassed by the scope of the present invention. Some examples of joining the wood strips through the use of an engagement member (strip) and a complementary engagement member (connector) are taught below.

[0031] Referring now to FIG.1A and 1B, a door made with a paper honeycomb 1.10 is compared with another made with panel ribs 1.12 as taught in the present invention.

[0032] In FIG. 2, it can be seen that short pieces or strips of wood 2.10 are joined with complementary notches. These engagement members and their complementary engagement members are elements of the present invention.

[0033] One way is to join short strips of wood is through the use of corresponding half notches 2.12 cut into the strips of wood. Multiple strips of wood may be joined side by side by using notches 2.14 that are correspondingly as wide as the thickness required.

[0034] While the joining of panel ribs with each other or with connector blocks are shown as notches 2.12 and 2.14, tongue-and-groove or mortise-and-tenon type joints (not shown) may also be used.

[0035] Another way to join strips of off-cuts is by the use of connector blocks (FIG. 3). Such connector blocks may be rectangular, circular or polygonal in cross-section and be of varying thickness. The use of connector blocks gives greater latitude to the pattern of latticework possible and hence greater usage of scrap wood.

[0036] For example, as may be seen in FIG. 3, a hexagonal 3.10 or circular connector will allow panels ribs to be joined in a radial pattern. In FIG 3, the strips are joined to connector block 3.10 by means of conventional woodworking fasteners such as nails 3.12, tacks, screws or angle plates.

[0037] Components described may join at angles to form a "T" joint, an "L" or "V" joint or a rectangle.

[0038] Connector blocks also allow end-to-end joining of panel ribs to form a longer strip of wood (FIG. 4). A connector that is notched 4.16 may be readily joined to both strips with 4.17 or without notches 4.18 at the ends. Means other than notches, mortise-and-tenon joints may be used to join these modular components under the present invention.

[0039] The complementary structures of these components cited above allow these components to be connected without the need for adhesives. This lowers costs and speeds up production.

[0040] Similarly, instead of using the methods or modular components described above, the engagement members may also be joined by the connecting means with conventional woodworking fasteners such as nails, tacks or screws.

[0041] FIG. 5A and 5B show two arrangements of latticework fabricated under the scope of the present invention. The panel ribs may be formed from a mixture of dedicated ribs 5.10 (eg the vertical continuous strips) of virgin, non-scrap wood, and scrap wood 5.12 (the diagonal ribs) or entirely of scrap wood 5.14 with the methods of joining described above. FIG. 1B is an example showing another possible arrangement of latticework under the present invention.

[0042] Even with the use of some virgin material, scrap wood still forms the bulk of the present invention, making it extremely environmentally friendly.

[0043] To practise this invention, the method of joining strips with notches is described as the preferred embodiment. Similar fabrication procedures and a combination of the joining methods, while not described in detail, may also be used.

[0044] Simple settings of a rip saw fence arrangement should first be determined and set up. This will generate useful strips of uniform width and thickness from the scrap wood.

[0045] Then a jig indicating the intervals at which to cut the notches should be used to determine where the notches should be cut. Although elaborate jigs may be used for this, a simple marked straight edge may also suffice.

[0046] Strips with notches cut at regular intervals are then rendered from scrap wood using the above arrangements.

[0047] Thus a ready supply of these modular components of uniformly cut strips, may be generated for the fabrication of hollow doors.

[0048] A hollow door is assembled as usual with the frame placed over the skin or panel of one side and this arrangement secured. A latticework of panel ribs may be assembled in place, in the hollow of the door.

Alternatively, the lattice may be assembled on a schematic of the frame and then placed in the hollow defined by the frame as a complete component.

[0049] The edges of the panel ribs in contact with the skin are painted with a suitable adhesive and the panel ribs placed in contact with the skin.

[0050] Again, wood glue or a suitable adhesive applied to the other exposed narrow edges of the panel ribs. With the use of half notches, the latticework of scrap wood need not be secured by any adhesive as contact with the skins of the door will keep them in place.

[0051] The skin of the other side is then place over the hollow such that both skins contact the adhesive. The skins are then held to the frame and panel ribs by presses until the glue has cured.

[0052] When the glue or adhesive has dried or cured, the door is trimmed and finished.

[0053] It will be apparent to anyone of ordinary skill in the art that the procedure of fabricating a hollow door may be varied significantly without affecting the finished product or departing from the scope of the present invention.

[0054] Again, it will be appreciated by anyone of ordinary skill in the art that handling the latticework of panel ribs is significantly easier than a manipulating a honeycomb of paper or cardboard.

[0055] The present invention is also non-obvious and entailed an inventive step, as apparent from the lack of prior art teaching the use of rendering and joining scrap wood strips into usable panel ribs for hollow doors.

[0056] The different latticework of panel ribs may be varied to suit the requirements of the door. If a stronger door is required, a denser arrangement of panel ribs with more cross-linked members may be used.

[0057] It will also be appreciated by anyone concerned with the environment that maximizing the use of scrap wood in the present invention is

environmentally friendly and will reduce the use of virgin material for the fabrication of hollow doors and products of similar construction.

[0058] While a wood hollow door is described, it will also be apparent to one of ordinary skill in the art that the invention may also be practiced in the fabrication of other furnishings and structures such as hollow partition panels, cabinets, writing boards, desk and table tops, and signboards, all of which utilize similar methods of construction and are hence within the scope of the present invention.

[0059] Various improvements, particularly to methods of joining the panel ribs together, may also be made without departing from the scope of the present invention.